

120.300: RADIATION SAFETY REQUIREMENTS FOR INDUSTRIAL RADIOGRAPHIC OPERATIONS

120.301: Purpose and Scope

- (A) Establish radiation safety requirements for persons using sources of radiation for industrial radiography,
- (B) Apply to all licensees and registrants who use sources of radiation for industrial radiography,
- (C) Apply to sealed radioactive sources and radiation machines, except for those regulations clearly applicable only to sealed radioactive sources; and,
- (D) Supplement, but do not replace, other applicable requirements of 105 CMR 120.000.

120.302: Definitions

As used in 105 CMR 120.300, the following definitions apply:

Annual Refresher Safety Training means a review conducted or provided by the licensee or registrant for its employees on radiation safety aspects of industrial radiography. The review may include, as appropriate, the results of internal audits, new procedures or equipment, new or revised regulations, accidents or errors that have been observed, and should also provide opportunities for employees to ask safety questions.

ANSI means American National Standards Institute.

Associated Equipment means equipment that is used in conjunction with a radiographic exposure device to make radiographic exposures that drives, guides, or comes in contact with the source, (such as, guide tube, control tube, control cable (drive cable), removable source stop, "J" tube and collimator when it is used as an exposure head)

Cabinet Radiography means industrial radiography conducted in an enclosure or cabinet so shielded that doses to individual members of the public at every location on the exterior meet the limitations specified in 105 CMR 120.221(A).

Cabinet X-Ray System means an x-ray system with the x-ray tube installed in an enclosure which, independent of existing architectural structures except the floor on which it may be placed, is intended to:

- (1) Contain at least that portion of a material being irradiated;
- (2) Provide radiation attenuation; and,
- (3) Exclude personnel from its interior during generation of x radiation.

Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities.

An x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding, is not considered a cabinet x-ray system.

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Certification means the authorization by the Massachusetts Radiation Control Program (Agency) of an individual to perform industrial radiography in the Commonwealth of Massachusetts.

Certification Identification (ID) Card means the document issued by the Agency to individuals who have completed the requirements stated in 105 CMR 120.320(B).

Certified Cabinet X-ray System means an x-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40.

Certified Industrial Radiographer means an individual who has met prescribed training and experience requirements and has passed an approved examination and is authorized by the Agency, pursuant to 105 CMR 120.321(H)(1), to perform industrial radiography.

Certifying Entity means an independent certifying organization or an Agreement State whose industrial radiographer certification program has been reviewed and found to have met the applicable parts of Appendix A of 10 CFR Part 34 for radioactive materials; or an independent certifying organization or radiation control agency whose x-ray/or combination certification requirements have been reviewed and found to be equivalent to criteria established by CRCPD.

Collimator means a small radiation shield of lead or other heavy metal which is placed on the end of a guide tube or directly onto a radiographic exposure device to restrict the size of the radiation beam when the sealed source is cranked into position to make a radiographic exposure.

Control Cable (Drive Cable) means the cable that is connected to the source assembly and used to drive the source from and return it to the shielded position.

Control Mechanism (Drive Mechanism) means a device that enables the source assembly to be moved from and returned to the shielded position. A drive mechanism is also known as a crank assembly.

Control Tube means a protective sheath for guiding the drive cable. The control tube connects the drive mechanism to the radiographic exposure device.

Crank-out Device means the cable, protective sheath, and hand crank used to move the sealed source from the shielded to the unshielded position to make an industrial radiographic exposure.

Enclosed Radiography means industrial radiography conducted in an enclosed cabinet or room and includes cabinet radiography and shielded room radiography.

Exposure Head (Source Stop) means a device that locates the gamma radiography sealed source in the selected working position. An exposure head is also known as a source stop.

Guide Tube means a flexible or rigid tube, such as a "J" tube, for guiding the source assembly and the attached control cable from the exposure device to the exposure head. The guide tube may also include the connections necessary for attachment to the exposure device and to the exposure head.

Independent Certifying Organization means an independent organization that meets all of the applicable parts of Appendix A of 10 CFR Part 34 for radioactive materials, and/or comparable criteria for x-ray/combination established by CRCPD.

Industrial Radiography means the examination of the macroscopic structure of materials by nondestructive methods using sources of radiation derived from radioactive materials or radiation machines. For purposes of 105 CMR 120.300, industrial radiography does not include radiography performed with Lixiscopes or cabinet x-ray systems, nor does it include computed tomography or computer-based digital radiography in which the useful beam of radiation is collimated to detectors.

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Industrial Radiography -Radiation Machines means the process of performing industrial radiography using radiation producing machines.

Industrial Radiography -Radioactive Materials means the process of performing industrial radiography using radioactive materials.

Lay-barge Radiography means industrial radiography performed on any water vessel used for laying pipe.

Lixiscope means a portable light-intensified imaging device using iodine-125 as a sealed source.

Lock-out Survey means a radiation survey performed to determine that a sealed source is in its shielded position. The lock-out survey is performed before moving the radiographic exposure device or source changer to a new location or securing the radiographic exposure device or source changer.

Offshore Platform Radiography means industrial radiography conducted from a platform over a body of water.

Permanent Radiographic Installation means an installation or structure designed or intended for radiography and in which radiography is regularly performed and meets all the requirements of 105 CMR 120.319

Personnel Monitoring Badge means a whole body individual monitoring device that meets the requirements of 105 CMR 120.323(B).

Personal Supervision means supervision provided by a Certified Industrial Radiographer who is physically present at the site where sources of radiation and associated equipment are being used, visually evaluating the Radiographer Trainee and in such proximity that immediate assistance can be given if required.

Radiation Machine means any device capable of producing ionizing radiation except those which produce radiation only from radioactive material.

Radiation Safety Officer means an individual named by the licensee or registrant who has a knowledge of, responsibility for, and authority to enforce appropriate radiation protection rules, standards, and practices on behalf of the licensee and/or registrant and who meets the requirements of 105 CMR 120.380 and 120.005.

Radiographer means any individual who has successfully completed the training, testing and documentation requirements of 105 CMR 120.320(B), and who performs or personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of 105 CMR 120.000 and all license and/or certificate of registration conditions.

Radiographer Trainee means any individual who has successfully completed the training and testing requirements of 105 CMR 120.320(A) and who uses sources of radiation and related handling tools or radiation survey instruments under the personal supervision of a radiographer trainer.

Radiographic Exposure Device (Camera or Projector) means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

Radiographic Personnel means any radiographer or radiographer trainee.

Sealed Source (Pill) means any radioactive material that is used as a source of radiation and is encased in a capsule designed to prevent leakage or escape of the radioactive material.

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Shielded Position means the location within the radiographic exposure device or source changer where the sealed source is secured and restricted from movement.

S-tube means a tube through which the radioactive source travels when inside a radiographic exposure device.

Shielded-room Radiography means industrial radiography conducted in a room so shielded that radiation levels at every location on the exterior meet the limitations specified in 105 CMR 120.221(A).

Source Assembly (Pigtail) means a component to which the sealed source is affixed or in which the sealed source is contained. The source assembly includes the sealed source.

Source Changer means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those source changers also used for transporting and storage of sealed sources.

Source Stop see "Exposure Head".

Storage Area means any location, facility, or vehicle which is used to store, to transport, or to secure a radiographic exposure device, a storage container, or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with, or unauthorized removal of the device, machine, container, or sealed source.

Storage Container means a device other than a source changer in which sealed sources are stored.

Temporary Job Site means any location where industrial radiography is performed other than the location(s) listed in a specific license or certificate of registration.

Transport Container means a package that is designed to provide radiation safety and security when sealed sources are transported and meets all applicable requirements of the U.S. Department of Transportation.

Underwater Radiography means industrial radiography performed when the radiographic exposure device and/or related equipment are beneath the surface of the water.

120.303: Exemptions

(A) Certified cabinet x-ray systems are exempt from the requirements of 105 CMR 120.300 except for the requirements of 105 CMR 120.337(C) and (D).

(B) Industrial uses of lixiscopes are exempt from the rules in 105 CMR 120.300. Lixiscope use is regulated under 105 CMR 120.100.

120.305: Licensing and Registration Requirements for Industrial Radiographic Operations

The Agency will approve an application for a specific license for the use of licensed material or a registration for use of radiation machines if the applicant meets the following requirements:

(A) The applicant satisfies the general requirements specified in 105 CMR 120.020 for radiation machine facilities or 105 CMR 120.100 for radioactive material, as applicable, and any special requirements contained in 105 CMR 120.300;

(B) The applicant submits an adequate program for training radiographers and radiographer trainees that meets the requirements of 105 CMR 120.320;

(C) The applicant submits procedures for verifying and documenting the certification status of radiographers and for ensuring that the certification of individuals acting as radiographers remains valid;

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(D) The applicant submits written operating and emergency procedures as described in 105 CMR 120.325;

(E) The applicant submits a description of a program for inspections of the job performance of each radiographer and radiographer trainee at intervals not to exceed six months as described in 105 CMR 120.320(C);

(F) The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;

(G) The applicant submits the qualifications of the individual(s) designated as the radiation safety officer as described in 105 CMR 120.380(B) and potential designees responsible for ensuring that the licensee's radiation safety program is implemented in accordance with approved procedures;

(H) If an applicant intends to perform leak testing of sealed sources or exposure devices containing depleted uranium (DU) shielding, the applicant must describe the procedures for performing the test and analyzing the samples. The description must include the:

- (1) Methods of collecting the samples;
- (2) Instruments to be used;
- (3) Methods of analyzing the samples; and
- (4) Pertinent experience of the person who will analyze the wipe samples.

(I) If the applicant intends to perform calibrations of survey instruments and alarming ratemeters, the applicant must describe methods to be used and the experience of the person(s) who will perform the calibrations. All calibrations must be performed according to the procedures described and at the intervals prescribed in 105 CMR 120.314 and 120.323(B)(8);

(J) the applicant identifies and describes the location(s) of all field stations and permanent radiographic installations; and

(K) The applicant identifies the location(s) where all records required by 105 CMR 120.300 and other parts of 105 CMR 120.000 will be maintained.

120.310: Records of Receipt, Transfer, and Disposal of Sources of Radiation

Each licensee and registrant shall maintain records showing the receipt, transfer, and disposal of sources of radiation. These records shall include the date, the individual making the record, the radionuclide, number of curies, and make, model, and serial number of each source of radiation and device, as appropriate. Records shall be maintained for Agency inspection until disposal is authorized by the Agency.

120.311: Limits on Levels of Radiation for Radiographic Exposure Devices, Source Changers, and Transport Containers

The maximum exposure rate limits for storage containers and source changers are 2 mSv/hr (200 mrem/hr) at any exterior surface, and 0.1 mSv/hr (10 mrem/hr) at one meter from any exterior surface with the sealed source in the shielded position.

120.312: Locking of Sources of Radiation, Storage Containers and Source Changers

(A) The control panel of each radiation machine shall be equipped with a locking device which will prevent the unauthorized use of an x-ray system or the accidental production of radiation. The radiation machine shall be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or radiographer trainee, or an individual specifically authorized by the Agency.

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(B) Each radiographic exposure device must have a lock or outer lockable container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device and/or its container must be kept locked and, if a keyed lock, the key removed at all times when not under the direct surveillance of a radiographer or radiographer trainee, or an individual specifically authorized by the Agency except at permanent radiographic installations as stated in 105 CMR 120.319. In addition, during radiographic operations the sealed source assembly must be secured in the shielded position each time the source is returned to that position.

(C) Each sealed storage container and source changer must have a lock or outer lockable container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers must be kept locked, and if a keyed lock the key removed when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer trainee.

(D) The sealed source shall be secured in its shielded position by locking the exposure device or securing the remote control each time the sealed source is returned to its shielded position. Then a survey shall be performed to determine that the sealed source is in the shielded position pursuant to 105 CMR 120.333(B).

120.314: Radiation Survey Instruments

(A) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by 105 CMR 120.300 and 120.225(A). Instrumentation required by 105 CMR 120.300 shall have a range from 0.02 mSv/hr (2 mrem/hr) through 0.01 Sv/hr (1 rem/hr).

(B) Each radiation survey instrument shall be calibrated:

- (1) By a person licensed or registered by the Agency, another Agreement State, a Licensing State, or the U.S. Nuclear Regulatory Commission to perform such service;
- (2) At energies appropriate for the licensee's or registrant's use;
- (3) At intervals not to exceed six months and after each instrument servicing other than battery replacement;
- (4) To demonstrate an accuracy within plus or minus 20%; and,
- (5) At two points located approximately $\frac{1}{4}$ and $\frac{3}{4}$ of full-scale on each scale for linear scale instruments; at midrange of each decade, and at two points of at least one decade for logarithmic scale instruments; and for digital instruments, at three points between 0.02 and 10 mSv/hr (2 and 1,000 mrem/hr).

(C) Records of these calibrations shall be maintained for Agency inspection for five years after the calibration date.

(D) Each radiation survey instrument shall be checked with a radiation source at the beginning of each day of use and at the beginning of each work shift to ensure it is operating properly.

120.315: Performance Requirements for Industrial Radiography Equipment

(A) Conformance with ANSI Standards. Equipment used in industrial radiographic operations shall meet the following minimum criteria:

- (1) Each radiographic exposure device, source assembly, sealed source, and associated equipment shall meet the criteria set forth by ANSI N432-1980.
- (2) Radiation machines manufactured after January 10, 1992 used in industrial radiographic operations shall be certified at the time of manufacture to meet the criteria set forth by ANSI N537- 1976, except accelerators used in industrial radiography.
- (3) All radiographic exposure devices and associated equipment in use after January 10, 1996, must comply with the requirements of 105 CMR 120.315.

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(4) In *lieu* of 105 CMR 120.315(A)(1), equipment used in industrial radiographic operations need not comply with § 8.9.2(c) of the Endurance Test in ANSI N432-1980, if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment can realistically exert on the lever or crankshaft of the drive mechanism.

(5) Engineering analysis may be submitted by a licensee to demonstrate the applicability of previously performed testing on similar individual radiography equipment components. Upon review, the agency may find this an acceptable alternative to actual testing of the component in accordance with 105 CMR 120.315(A)(1).

(6) In addition to the requirements specified in 105 CMR 120.315(A)(1), the following requirements apply to radiographic exposure devices, source changers, source assemblies, sealed sources and associated equipment.

(a) The licensee shall ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing the:

1. Chemical symbol and mass number of the radionuclide in the device;
2. Activity and the date on which this activity was last measured;
3. Model or product code and serial number of the sealed source;
4. Name of the manufacturer of the sealed source; and,
5. Licensee's name, address, and telephone number.

(b) Radiographic exposure devices intended for use as Type B packages must meet the applicable transportation requirements of 10 CFR part 71.

(c) Opening, repair or modification of radiographic exposure devices, source changers, and source assemblies and associated equipment is prohibited, unless approved by the Agency, the U.S. Nuclear Regulatory Commission (NRC) or Agreement State.

(7) Modification of any exposure devices and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.

(B) Labeling Storage, and Transportation

(1) The licensee may not use a radiographic exposure device source changer or a container to store radioactive material unless the radiographic exposure device source changer or the storage container has securely attached to it a durable, legible, and clearly visible label bearing the standard trefoil radiation caution symbol conventional colors, *i.e.*, magenta, purple or black on a yellow background, having a minimum diameter of 25 mm, and the wording:

"CAUTION. RADIOACTIVE MATERIAL. NOTIFY CIVIL AUTHORITIES (OR NAME OF COMPANY)" or "DANGER. RADIOACTIVE MATERIAL. NOTIFY CIVIL AUTHORITIES (OR NAME OF COMPANY)."

(2) The licensee may not transport radioactive material unless the material is packaged, and the package is labeled, marked, and accompanied with appropriate shipping papers in accordance with 105 CMR 120.770

(3) Radiographic exposure devices, source changers, storage containers, and radiation machines, must be physically secured to prevent tampering or removal by unauthorized personnel. The licensee shall store radioactive material in a manner that will minimize danger from explosion or fire.

(4) The licensee shall lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.

(5) The licensee's or registrant's name and city or town where the main business office is located shall be prominently displayed with a durable, clearly visible label(s) on both sides of all vehicles used to transport radioactive material or radiation machines for temporary job site use.

(C) Performance Requirements. In addition to the requirements specified in 105 CMR 120.315(A) and (B), the following requirements apply to radiographic exposure devices, source assemblies, and associated equipment that allow the source to be moved out of the device for routine operations or to source changers:

- (1) The coupling between the source assembly and the control cable must be designed in such a manner that the source assembly will not become disconnected if cranked outside the guide tube. The coupling must be such that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.
- (2) The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.
- (3) The outlet fittings, lock box, and drive cable fittings on each radiographic exposure device must be equipped with safety plugs or covers which must be installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.
- (4) Each sealed source or source assembly must have attached to it or engraved on it, a durable, legible, visible label with the words:

"DANGER -- RADIOACTIVE."

The label must not interfere with the safe operation of the exposure device or associated equipment.

- (5) The guide tube must be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use, and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use.
- (6) Guide tubes must be used when moving the source out of the device.
- (7) An exposure head, endcap, or similar device designed to prevent the source assembly from passing out of the end of the guide tube shall be attached to the outermost end of the guide tube during radiographic operations.
- (8) The guide tube exposure head connection must be able to withstand the tensile test for control units specified in ANSI N432-1980.
- (9) Source changers must provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.

(D) Leak Testing and Replacement of Sealed Sources.

- (1) The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing of any sealed source must be performed by persons authorized to do so by the Agency, the Nuclear Regulatory Commission, or another Agreement State.
- (2) The opening, repair, or modification of any sealed source must be performed by persons specifically authorized to do so by the Agency, the Nuclear Regulatory Commission, or another Agreement State.
- (3) Each licensee who uses a sealed source shall have the source tested for leakage at intervals not to exceed six months. The leak testing of the source must be performed using a method approved by the Agency, the Nuclear Regulatory Commission, or by another Agreement State. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample must be analyzed for radioactive contamination. The analysis must be capable of detecting the presence of 185 becquerels (0.005 μ Ci) of radioactive material on the test sample and must be performed by a person specifically authorized by the Agency, the Nuclear Regulatory Commission, or another Agreement State to perform the analysis. The license shall maintain the records of the leak tests for inspection by the Agency for five years after it is made.
- (4) Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within six months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but must be tested before use or transfer to another person if the interval of storage exceeds six months.
- (5) Any test conducted pursuant to 105 CMR 120.315(D)(1) and (2) which reveals the presence of 185 Bq (0.005 microcuries) or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with regulations of the Agency. Within five days after obtaining results of the test, the licensee shall file a report with the Agency describing the equipment involved, the test results, and the corrective action taken.

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(6) Each exposure device using DU shielding and an "S" tube configuration shall be tested for DU contamination at intervals not to exceed 12 months. The analysis must be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and must be performed by a person specifically authorized by the Commission or an Agreement State to perform the analysis. Should such testing reveal the presence of DU contamination, the exposure device must be removed from use until an evaluation of the wear of the S-tube has been made. Should the evaluation reveal that the S-tube is worn through, the device may not be used again. DU shielded devices do not have to be tested for DU contamination while in storage and not in use. Before using or transferring such a device, however, the device must be tested for DU contamination, if the interval of storage exceeds 12 months. Each licensee shall maintain records of leak testing of sealed sources and devices containing DU. The licensee shall retain each record for agency inspection for five years from the date of the leak test.

(7) An applicant or licensee who desires to conduct its own tests for leakage or contamination shall establish procedures to be followed when testing sealed sources for leakage or contamination and shall submit a description of such procedures to the Agency for approval. The description shall include the:

- (a) Instrumentation to be used;
- (b) Method of performing the tests; and
- (c) Pertinent experience of the individual(s) who will perform the test.

120.316: Quarterly Inventory

(A) Each licensee or registrant shall conduct a physical inventory at intervals not to exceed three months to account for all sources of radiation, and for devices containing depleted uranium received and possessed under the license or registration.

(B) The licensee or registrant shall maintain records of the quarterly inventory in accordance with 105 CMR 120.364.

120.317: Utilization Logs

Each licensee and registrant shall maintain current logs of the use of each source of radiation. The logs shall include:

(A) A unique identification (*e.g.*, serial number) of each radiation machine, each radiographic exposure device in which a sealed source is located, and each sealed source;

(B) The name of the radiographer using the source of radiation;

(C) The location(s) where each source of radiation is used and dates of use; and,

(D) The date(s) each source of radiation is removed from storage and returned to storage. For fixed installations, the date(s) each source of radiation is energized or used and the number of exposures made. Utilization logs may be kept on form MRCP 120.300-2, Utilization Log, or on clear, legible records containing all the information required by 105 CMR 120.317(A) through (D). Copies of utilization logs shall be maintained for Agency inspection for five years. The records shall be kept at the location specified by the license or certificate of registration.

120.318: Inspection and Maintenance of Radiation Machines, Radiographic Exposure Devices, Transport and Storage Containers, Associated Equipment, Source Changers, and Survey Instruments

(A) The radiographer shall perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before each day's use, or work shift, to ensure that:

- (1) The equipment is in good working condition;
- (2) The sources are adequately shielded; and,
- (3) Required labeling is present.

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- (B) Survey instrument operability must be performed using check sources or other appropriate means.
- (C) If equipment problems are found, the equipment must be removed from service until repaired.
- (D) Each licensee or registrant shall have written procedures for and perform inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers, and survey instruments at intervals not to exceed three months or before the first use thereafter to ensure the proper functioning of components important to safety. If equipment problems are found, the equipment must be removed from service until repaired.
- (E) The licensee's inspection and maintenance program must include procedures to assure that Type B packages are shipped and maintained in accordance with the certificate of compliance or other approval.
- (F) Records of equipment problems and of any maintenance performed under 105 CMR 120.318 must be made in accordance with 105 CMR 120.366

120.319: Permanent Radiographic Installations

- (A) Permanent radiographic installations shall have high radiation area entrance controls of the type described in 105 CMR 120.227(A)(2) and (3) and (B).
- (B) Each entrance that is used for personnel access to the high radiation area shall have both conspicuous visible and audible warning signals to warn of the presence of radiation. The visible signal shall be activated by radiation. The audible signal shall be activated when an attempt is made to enter the installation while the source is exposed.
- (C) The control device or alarm system shall be tested for proper operation with a source of radiation at the beginning of each day of equipment use. The test shall include a check for the visible and/or audible signals. Entrance control devices that reduce the radiation level upon entry as described in 105 CMR 120.227(A)(1) shall be tested monthly. If a control device or alarm system is operating improperly, it shall be immediately labeled as defective and repaired within seven calendar days. The facility may continue to be used during this seven-day period, provided the licensee or registrant implements the continuous surveillance requirements of 105 CMR 120.331, ensures that radiographic personnel use an alarming ratemeter, and complies with the requirements of 105 CMR 120.330(B). Records of these tests shall be maintained for Agency inspection for five years.

RADIATION SAFETY REQUIREMENTS

120.320: Training and Testing

- (A) Radiographer Trainee Requirements. The licensee or registrant shall not permit any individual to act as a radiographer trainee until the individual
 - (1) has received copies of and instructions in the requirements described in 105 CMR 120.300 and the applicable sections of 105 CMR 120.100, 120.200, 120.750 , and applicable DOT regulations as referenced in 105 CMR 120.770, a copy of the license or certificate of registration issued to the licensee or registrant and copies of and instructions in the licensee's or registrant's operating and emergency procedures;
 - (2) has demonstrated an understanding of items in 105 CMR 120.320(A)(1) by successful completion of a written or oral examination, administered by the licensee or registrant;
 - (3) has been instructed in the use of the licensee's or registrant's sources of radiation, radiographic exposure devices, associated equipment, related handling tools and radiation survey instruments that may be employed in industrial radiographic assignments; and

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- (4) has demonstrated, to the satisfaction of the licensee or registrant, an understanding of the instructions provided pursuant to 105 CMR 120.320(A)(2) and (3) as evidenced by successful completion of a written or oral test and a field examination on the subjects covered.
- (B) Radiographer Requirements. The licensee or registrant shall not permit any individual to act as a radiographer until the individual:
- (1) has completed a course of at least 40 hours on the applicable subjects outlined in 105 CMR 120.320(G). The course shall be one that has been accepted by the Agency, another radiation control agency or the NRC;
 - (2) has completed hands-on experience as a radiographer trainee under the personal supervision, as specified in 105 CMR 120.326, of one or more radiographers:
 - (a) Hands-on experience in addition to on the job training consisting of hands-on experience shall include at least minimum of two months (320 hours) of active participation in the performance of industrial radiography utilizing radioactive material and/or one month (160 hours) of active participation in the performance of industrial radiography utilizing radiation machines.
 - (b) Individuals performing industrial radiography utilizing radioactive materials and radiation machines must complete both segments of hands-on experience.
 - (3) has successfully completed within the last five years the appropriate agency-administered examination as prescribed in 105 CMR 120.321. Or the appropriate examination of another certifying entity that affords the same or comparable certification standards of 105 CMR 120.320(B);
 - (4) Possess a current certification ID card issued in accordance with 105 CMR 120.321(H) or by another certifying entity that affords the same or comparable certification standards as those afforded by 105 CMR 120.320(B);
 - (5) Once an individual has completed the requirements of 105 CMR 120.320(B)(4), the licensee or registrant is not required to submit the documentation referenced in 105 CMR 120.320(B)(1) and (2).
- (C) In addition, the licensee or registrant may not permit any individual to act as a radiographer until the individual:
- (1) has received copies of and instruction in the requirements described in 105 CMR 120.300 and the applicable sections of 105 CMR 120.100, 120.200, 120.750 , and applicable DOT regulations as referenced in 105 CMR 120.770, in the license or registration under which the radiographer's assistant will perform industrial radiography, and the licensee's or registrant's operating and emergency procedures;
 - (2) has demonstrated an understanding of items in 105 CMR 120.320(C)(1) by successful completion of a written or oral examination administered by the licensee or registrant;
 - (3) Has received training in the use and daily inspection of the registrant's radiation survey instruments, the registrant's radiation machines, or the licensee's radiographic exposure devices, associated equipment and related handling tools; and,
 - (4) Has demonstrated competence in the use of the equipment described in 105 CMR 120.320(C)(3) by successful completion of a practical examination administered by the licensee or registrant.
- (D) The licensee or registrant shall provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.
- (E) Except as provided in 105 CMR 120.320(E)(4), the radiation safety officer or designee shall conduct an inspection program of the job performance of each radiographer and radiographer trainee to ensure that the Agency's regulations, license or registration requirements, and operating and emergency procedures are followed. The inspection program must:
- (1) Include observation of the performance of each radiographer and radiographer trainee during an actual industrial radiographic operation, at intervals not to exceed six months; and,

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- (2) Provide that, if a radiographer or a radiographer trainee has not participated in an industrial radiographic operation for more than six months since the last inspection, the radiographer must demonstrate knowledge of the training requirements of 105 CMR 120.320(C)(3) and the radiographer's assistant must demonstrate knowledge of the training requirements of 105 CMR 120.320(A)(3) by a practical examination administered by the licensee or registrant before these individuals can next participate in a radiographic operation.
- (3) The Agency may consider alternatives in those situations where the individual serves as both radiographer and radiation safety officer.
- (4) In those operations where a single individual serves as both radiographer and radiation safety officer, and performs all radiography operations, an inspection program is not required.
- (F) The licensee or registrant shall maintain records of the above training to include certification documents, written, oral and practical examinations, refresher safety training and inspections of job performance in accordance with 105 CMR 120.367.
- (G) The licensee or registrant shall include the following subjects, as applicable, that are required in 105 CMR 120.320(B)(1):
- (1) Fundamentals of radiation safety including:
 - (a) Characteristics of gamma and x-radiation;
 - (b) Units of radiation dose and quantity of radioactivity;
 - (c) Significance of dose to include: radiation protection standards, biological effects of radiation dose, and case histories of industrial radiography incidents;
 - (d) Levels of radiation from sources of radiation; and,
 - (e) Methods of controlling radiation dose (time, distance, and shielding);
 - (2) Radiation detection instruments including:
 - (a) Use, operation, calibration, and limitations of radiation survey instruments;
 - (b) Survey techniques; and,
 - (c) Use of personnel monitoring equipment to include as a minimum, film badges, TLDs, OSLs, pocket dosimeters, alarming ratemeters and electronic personal dosimeters;
 - (3) Equipment to be used including:
 - (a) Operation and control of radiographic exposure equipment, remote handling equipment, and storage and transport containers, including pictures or models of source assemblies (pigtailed);
 - (b) Operation and control of radiation machines;
 - (c) Storage, control, and disposal of sources of radiation; and,
 - (d) Inspection and maintenance of equipment.
 - (4) The requirements of pertinent state and federal regulations; and,
 - (5) Generic written operating and emergency procedures.

120.321: Applications and Examinations

- (A) Any individual applying to the Agency for certification to perform industrial radiography shall:
- (1) submit a complete and legible application on forms prescribed and furnished by the Agency.
 - (2) pay the appropriate non-refundable fee in accordance with 105 CMR 120.321(J) .
 - (3) meet the examination requirements set forth in 105 CMR 120.321(D) or satisfy the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K); and,
 - (4) provide evidence that the requirements for the given category and class for which certification is sought have been met.
- (B) Application. The appropriate fee shall accompany the application when filing with the Agency. An application shall be deemed filed on the date that it is received by the Agency or on the date that it is postmarked by the United States Postal Service.
- (C) Categories of Certification.
- (1) The Agency shall certify individuals to perform industrial radiography as Certified Industrial Radiographer.

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(2) Each certification issued shall include a class endorsement for the type of industrial radiography authorized. Such class endorsements are limited to:

- (a) Radioactive Materials;
- (b) Radiation Machines; or
- (c) Radioactive Materials and Radiation Machines.

(D) Examination Requirements. An individual who seeks certification as a Certified Industrial Radiographer must have passed, prior to application for certification, a written examination appropriate to the category of certification sought in accordance with 105 CMR 120.321(E). An individual seeking certification as a Certified Industrial Radiographer must pass, within 12 months prior to application for certification, a written examination appropriate to the category and class of certification sought in accordance with 105 CMR 120.321(G).

(E) Examination. The Agency shall accept results of examinations given by certifying entities as defined in 105 CMR 120.302.

(F) Approved Training Program. Industrial radiographer training programs shall be approved by the Agency. The Agency shall recognize training programs approved by certifying entities.

(G) Experience Requirements for Certification. Applicants for certification to perform industrial radiography shall have a minimum of experience appropriate to each category and class of industrial radiography as follows:

Certified Industrial Radiographer

(1) Radioactive Materials..... 200 hrs

(2) Radiation Machines 120 hrs

(3) Both Radioactive Materials and Radiation 320 hrs

Machines of which not less than 200 hours shall be with radioactive materials and not less than 120 hours shall be with radiation machines.

(H) Requirements for Issuance of Certification. The Agency shall certify in a category and class of industrial radiography any individual who has satisfied the following requirements:
Certified Industrial Radiographer:

- (1) Submitted an application for certification on a form prescribed by the Department;
- (2) Submitted the application fee specified in 105 CMR 120.321(J)(1);
- (3) Passed an examination as required by 105 CMR 120.321(D) or satisfies the requirements or certification based on reciprocity as set forth in 105 CMR 120.321(K); and,
- (4) Completed the required hours of experience in industrial radiography as specified in 105 CMR 120.321(G) or satisfies the requirements for certification based on reciprocity as set forth in 105 CMR 120.321(K)

(I) Duration of Certification. The duration of certification issued by the Agency shall be:

Certified Industrial Radiographer five years

(J) Fees.

- (1) The application fees for certification shall be non-refundable and shall be as specified for Certified Industrial Radiographer.
- (2) The appropriate fees shall accompany the application when filing with the Agency.

(K) Reciprocity.

- (1) The Agency shall issue certification to an applicant who has been certified in another state or jurisdiction provided that:
 - (a) The applicant holds a valid certification in the appropriate category issued by another state or jurisdiction;
 - (b) The jurisdiction that issued the certification is a certifying entity.
 - (c) The applicant presents a copy of the certification document issued by the other jurisdiction to the Agency; and
 - (d) The applicant submits the application fee in accordance with 105 CMR 120.321(J)(1).

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- (2) Individuals who are certified by reciprocity shall either:
 - (a) Maintain the certification upon which the reciprocal certification was issued; or
 - (b) Satisfy the requirements of 105 CMR 120.321(H) prior to the expiration of the certification upon which reciprocal certification was issued.
- (L) Requirements for Renewal of Certification.
 - (1) Prerequisites:
 - (a) An individual shall submit an application for re-examination and renewal of certification at least six months prior to the expiration date of certification. The Agency shall waive this requirement if the applicant satisfies the requirements of 105 CMR 120.321(A). An individual may not legally perform industrial radiography without valid certification.
 - (b) Each applicant shall submit a complete and legible application with the fee for renewal of certification in accordance with 105 CMR 120.321(A).
 - (2) Re-examination. Applicants for renewal of certification shall meet the requirements of 105 CMR 120.321(H)(1) including re-examination as described in 105 CMR 120.321(L)(1).
 - (3) An I.D. card shall be issued to each person who successfully completes the examination prescribed in 105 CMR 120.321(E).
 - (4) Each person's I.D. card shall contain his/her photograph. The Agency will take the photograph at the time the examination is administered.
 - (5) The I.D. card remains the property of the Commonwealth of Massachusetts and may be revoked or suspended under the provisions of 105 CMR 120.322.
 - (6) A fee of \$15.00 shall be paid to the Agency for each replacement of a lost I.D. card.

120.322: Revocation or Suspension of an I.D. Card

- (A) Any radiographer who violates 105 CMR 120.000 may be required to show cause at a formal hearing why his/her I.D. card should not be revoked or suspended.
- (B) When an Agency order has been issued for an industrial radiographer to cease and desist from the use of radioactive material or revoking or suspending his/her I.D. card, the industrial radiographer shall surrender the I.D. card to the Agency until such time as the order is changed or the suspension expires.
- (C) The Agency may act to suspend or revoke an individual's certification for any one or a combination of the following causes:
 - (1) Knowingly causing a material misstatement or misrepresentation to be made in the application for initial certification or renewal of certification if such misstatement or misrepresentation would impair the Agency's ability to assess and evaluate the applicant's qualifications for certification pursuant to 105 CMR 120.321;
 - (2) Knowingly falsifying records of employees when such falsification would impair the Agency's ability to assess and evaluate the applicant's qualifications for certification pursuant to 105 CMR 120.321;
 - (3) Willfully evading the statute or regulations pertaining to certification, or willfully aiding another person in evading such statute or regulations pertaining to certification;
 - (4) Exhibiting significant or repeated incompetence in the performance of industrial radiography duties;
 - (5) Performing industrial radiography in such a manner that requirements of 105 CMR 120.300 are violated resulting in a threat to health and safety of the individual, other workers or the public;
 - (6) Having had a similar certification suspended or revoked if the grounds for that suspension or revocation are the same or equivalent to one or more grounds for suspension or revocation as set forth in 105 CMR 120.016(C);
 - (7) Failure to maintain the out-of-state certification upon which certification by reciprocity was issued;

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(D) If, based upon any of the grounds in 105 CMR 120.322(C), the Agency determines that action to suspend or revoke certification is warranted, the Agency shall notify the individual and shall provide an opportunity for a hearing in accordance with 801 CMR 1.01 *et seq.* An opportunity for a hearing shall be provided before the Agency takes action to suspend or revoke an individual's certification unless the Agency finds that an immediate suspension of certification is required to protect against immediate danger to the public health or safety, in which case the Agency shall suspend an individual's certification pending a hearing.

(E) If the Agency finds that removal of certification is warranted, the usual action shall be a suspension of certification for up to one year. The term of suspension may be reduced by the Director of the Radiation Control Program, upon the recommendation of the hearing officer, if the hearing officer finds, based upon evidence presented to him/her during a hearing, that the conditions leading to the Preliminary Order for Suspension can be cured in less than one year. However, if the Agency finds that the causes are of a serious or continuous nature, such as past actions which posed an immediate threat to occupational or public health or safety, deficiencies that cannot be cured within one year, the Agency shall revoke the individual's certification.

(F) When an individual's certification is suspended or revoked, the individual shall surrender his/her certification document to the Agency until the termination of the suspension period or until reissuance of the certification.

(G) An individual whose certification has been revoked may seek reinstatement of certification by filing with the Agency a petition for reinstatement. Such petition may be filed one year or more after the beginning of the revocation period.

120.323: Personnel Monitoring

(A) The personnel monitoring program shall meet the applicable requirements of 105 CMR 120.200.

(B) When performing industrial radiographic operations the following shall apply:

(1) The licensee or registrant shall not permit an individual to act as a radiographer, or radiographer trainee unless each individual wears, on the trunk of the body at all times during radiographic operations, a combination of a direct-reading pocket dosimeter or an electronic personal dosimeter, an alarming ratemeter, and a personnel monitoring badge that is processed and evaluated by an accredited NVLAP processor. At permanent radiography installations where other appropriate alarming or warning devices are in routine use, the wearing of an alarming ratemeter is not required.

(2) Pocket dosimeters shall meet the criteria in ANSI N13.5-1972 and shall have a range of zero to two millisieverts (zero to 200 millirems).

(3) Pocket dosimeters shall be recharged at the start of each work shift.

(4) Exposure indicated by each pocket dosimeter shall be recorded at the beginning of and at the end of each work shift.

(5) If an individual's pocket dosimeter is discharged beyond its range (*i.e.*, goes "off-scale"), or if an individual's electronic personal dosimeter reads greater than two millisieverts (200 mrem), industrial radiographic operations by that individual shall cease and the individual's personnel monitoring badge shall be processed immediately. The individual shall not return to work with sources of radiation until a determination of his/her radiation exposure has been made.

(6) Each personnel monitoring badge shall be assigned to and worn by only one individual.

(7) If a personnel monitoring badge is lost or damaged, the worker shall cease work immediately until a replacement personnel monitoring badge is provided and the exposure is calculated for the time period from issuance to loss or damage of the personnel monitoring badge.

(8) Each alarm dosimeter must:

(a) Be checked to ensure that the alarm functions properly (sounds) prior to use at the start of each shift.

(b) Emit an alarm signal at a preset dose rate of five mSv/hr (500 mr/hr).

(c) Require special means to change the preset alarm function; and

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(d) Be tested at periods not to exceed one year for correct response to radiation. Acceptable dosimeters must alarm within plus or minus 20% of the true radiation dose rate.

(C) Records of pocket dosimeter readings of personnel exposures shall be maintained for five years by the licensee or registrant for Agency inspection. If the dosimeter readings were used to determine external radiation dose (*i.e.*, no TLD, OSL or film badge exposure records exist), the records shall be maintained until the Agency authorizes disposal.

(D) Pocket dosimeters shall be checked for correct response to radiation at periods not to exceed one year. Acceptable dosimeters shall read within plus or minus 20% of the true radiation exposure. Records of pocket dosimeter calibrations shall be maintained for five years by the licensee or registrant for Agency inspection.

(E) Processors of film badge, TLD and OSL devices must be certified by the NVLAP.

120.325: Operating and Emergency Procedures

(A) Operating and emergency procedures must include, as a minimum, instructions in the following:

- (1) Appropriate handling and use of sources of radiation for industrial radiography so that no person is likely to be exposed to radiation doses in excess of the limits established in 105 CMR 120.200;
- (2) Methods and occasions for conducting radiation surveys;
- (3) Methods for posting and controlling access to radiographic areas;
- (4) Methods and occasions for locking and securing sources of radiation;
- (5) Personnel monitoring and the use of personnel monitoring equipment;
- (6) Transporting equipment to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when required, and control of the equipment during transportation as described in 105 CMR 120.770;
- (7) The inspection, maintenance, and operability checks of radiographic exposure devices and associated equipment, radiation machines, survey instruments, alarming ratemeters, transport containers, and storage containers and source changers;
- (8) Steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale or an alarming ratemeter alarms unexpectedly;
- (9) The procedure(s) for identifying and reporting defects and noncompliance, as required by 105 CMR 120.385;
- (10) The procedure for notifying proper persons in the event of an accident or incident;
- (11) Minimizing exposure of persons in the event of an accident or incident, including a source disconnect, a transport accident, or loss of a source of radiation;
- (12) Source recovery procedure if licensee will perform source recoveries;
- (13) Maintenance of records; and,
- (14) The procedures for calculating exposures as required by 105 CMR 120.323(B), when a personnel monitoring badge is lost or damaged.

(B) The licensee or registrant shall maintain copies of current operating and emergency procedures in accordance with 105 CMR120.367 and 105 CMR120.371.

120.326: Supervision of Radiographer Trainee

The radiographer's assistant shall be under the personal supervision of a radiographer when using sources of radiation, including radiation machines, radiographic exposure devices, associated equipment, or related handling tools, or while conducting radiation surveys required by 105 CMR 120.333(B) to determine that the sealed source has returned to the shielded position or the radiation machine has stopped producing radiation after an exposure. The personal supervision must include:

(A) The radiographer's physical presence at the site where the sources of radiation are being used;

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- (B) The availability of the radiographer to give immediate assistance if required; and
- (C) the radiographer's direct observation of the trainee's performance of the operations referred to in this section.

120.328: Conducting Industrial Radiographic Operations

- (A) Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer must be accompanied by at least one other qualified radiographer or an individual who has at a minimum met the requirements of 105 CMR120.320(C). The additional qualified individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one qualified individual is present.
- (B) All radiographic operations must be conducted in a permanent radiographic installation unless otherwise specifically authorized by the Agency.
- (C) Except when physically impossible, collimators shall be used in industrial radiographic operations that use radiographic exposure devices that allow the source to be moved out of the device.
- (D) A licensee or registrant may conduct lay-barge, offshore platform, or underwater radiography only if procedures have been approved by the Agency, the Nuclear Regulatory Commission, or by another Agreement State.

120.331: Surveillance

- (A) During each industrial radiographic operation, a radiographer or radiographer trainee shall maintain visual surveillance of the operation to protect against unauthorized entry into a radiation area or high radiation area, except where the high radiation area is equipped with a control device or alarm system as described in 105 CMR 120.227(A) or (B).
- (B) Radiographic exposure devices shall not be left unattended except when in storage or physically secured against unauthorized removal.
- (C) The sealed source shall be secured and immobilized in its shielded position in the radiographic exposure device with an appropriate locking or latching mechanism each time the sealed source is returned to its shielded position.
- (D) Notwithstanding the requirements of 105 CMR 120.243(A), High Radiation Area warnings may be placed at the periphery of the Radiation Area, or at the perimeter of access control.

120.332: Posting

Areas in which industrial radiography is being performed shall be posted conspicuously in accordance with 105 CMR 120.200 including:

- (A) Radiation Areas. Each radiation area shall be posted conspicuously with a sign or signs displaying the radiation symbol and the words:

CAUTION (OR DANGER)

RADIATION AREA

Radiation Area means any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.05 mSv (0.005 rem) in one hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

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(B) High Radiation Area. Each high radiation area shall be posted conspicuously with a sign or signs displaying the radiation symbol and the words:

CAUTION (OR DANGER)

HIGH RADIATION AREA

High Radiation Area means an area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of one mSv (0.1 rem) in one hour at 30 centimeters from any source of radiation or from any surface that the radiation penetrates.

(C) Ropes and/or barriers shall be used as necessary to prevent unauthorized entry to radiation areas.

(D) Notwithstanding the requirements of 105 CMR 120.242(A), each radiation area may be posted in accordance with 105 CMR 120.242(B), *i.e.*, High Radiation Area warnings may be placed at the periphery of the controlled area.

120.333: Radiation Surveys and Survey Records

(A) No radiographic operation shall be conducted unless at least one calibrated and operable radiation survey meter, as described in 105 CMR 120.314, is available and used at each site where radiographic exposures are made.

(B) A survey with a radiation survey instrument shall be made after each radiographic exposure to determine that the sealed source has been returned to its shielded position. The entire circumference of the radiographic exposure device, including the source guide tube and collimator if provided, shall be surveyed.

(C) A survey shall be made of the storage area as defined in 105 CMR 120.302 whenever a radiographic exposure device is being placed in storage.

(D) A physical radiation survey shall be made after each radiographic exposure using radiation machines to determine that the machine is "off."

(E)(1) All potential radiation areas in which industrial radiographic operations are to be performed shall be posted in accordance with 105 CMR 120.332, based on calculated dose rates, before industrial radiographic operations begin. An area survey shall be performed during the first radiographic exposure (*i.e.*, with the sealed source in the exposed position) to confirm that 105 CMR 120.332 requirements have been met and that unrestricted areas do not have radiation levels in excess of the limits specified in 105 CMR 120.221(A). Surveys to confirm the extent of the High Radiation Area, one mSv/hr (100 mr/hr), within the Radiation Area should not be undertaken.

(2) Each time the exposure device is relocated and/or the exposed position of the sealed source is changed, the requirements of 105 CMR 120.333(E)(1) shall be met.

(3) The requirements of 105 CMR 120.333(E)(2) do not apply to pipeline industrial radiographic operations when the conditions of exposure including, but not limited to, the radiographic exposure device, duration of exposure, source strength, pipe size, and pipe thickness remain constant.

(F) A survey with a radiation survey instrument shall be made to determine that the sealed source has been returned to its shielded position any time a radiographic exposure device is placed in storage. The entire circumference of the radiographic exposure device, including the source guide tube and collimator if provided, shall be surveyed.

(G) If a vehicle is to be used for storage of radioactive material, a vehicle survey shall be performed after securing radioactive material in the vehicle and before transport to ensure that radiation levels do not exceed the limits specified in 105 CMR 120.221(A) at the exterior surface of the vehicle.

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(H) Surveys shall be performed on storage containers to ensure that radiation levels do not exceed the limits specified in 105 CMR 120.221(A). These surveys shall be performed initially with the maximum amount of radioactive material present in the storage location and thereafter at the time of the quarterly inventory and whenever storage conditions change.

(I) A survey meeting the requirements of 105 CMR 120.333(F) shall be performed on the radiographic exposure device and the source changer after every sealed source exchange.

(J) Records shall be kept of the surveys required by 105 CMR 120.333(E), (F), (G), (H), (I) and 105 CMR 120.318(A). These records shall be maintained for Agency inspection for five years after completion of the survey. If a survey was used to determine an individual's exposure due to loss of personnel monitoring data, the records of the survey shall be maintained until the Agency authorizes disposal.

120.334: Records Required at Temporary Job Sites

Each licensee and registrant conducting industrial radiography at a temporary job site shall have the following records available at that site for Agency inspection:

- (A) The appropriate license or certificate of registration or equivalent document;
- (B) The appropriate operating and emergency procedures;
- (C) The applicable Agency rules;
- (D) The survey records required pursuant to 105 CMR 120.333 for the period of operation at the site;
- (E) The daily pocket dosimeter records for the period of operation at the site; and,
- (F) The most recent records of instrument and device calibration and source leak tests. Acceptable records include tags or labels which are attached to the devices or survey instruments and decay charts for sources which have been manufactured within the last six months.

120.337: Special Requirements and Exemptions for Enclosed Radiography

(A) Systems for enclosed radiography, including shielded-room radiography and cabinet x-ray systems not otherwise exempted, shall comply with all applicable requirements of 105 CMR 120.300.

(B) Systems for enclosed radiography designed to allow admittance of individuals shall be evaluated at intervals not to exceed one year to ensure compliance with the applicable requirements of 105 CMR 120.300, 120.221(A) and 120.222. Records of these evaluations shall be maintained for Agency inspection for five years after the evaluation.

(C) Certified cabinet x-ray systems are exempt from the requirements of 105 CMR 120.300 except that:

- (1) The registrant shall comply with the requirements of 105 CMR 120.020 and 120.200.
- (2) Tests for proper operation of interlocks must be conducted and recorded in accordance with 105 CMR 120.319. Records of these tests shall be maintained for Agency inspection until disposal is authorized by the Agency.
- (3) The registrant shall perform an evaluation to determine compliance with 21 CFR 1020.40 at intervals not to exceed one year. Records of these evaluations shall be maintained for Agency inspection for five years after the evaluation.

(D) Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 and no modification may be made to the system unless prior agency approval has been granted by the Agency pursuant to 105 CMR 120.020.

120.340: Underwater and Lay-barge Radiography

- (A) Underwater and/or lay-barge radiography shall not be performed unless specifically authorized in a license issued by the agency in accordance with 105 CMR 120.360.
- (B) In addition to the other requirements of 105 CMR 120.300, the following requirements apply to the performance of lay-barge radiography:
- (1) Cobalt-60 sources with activities in excess of 740 GBq (20 Ci) (nominal) and iridium-192 sources with activities in excess of 3.70 TBq (100 Ci) (nominal) shall not be used in the performance of offshore platform or lay-barge radiography.
 - (2) Collimators shall be used for all industrial radiographic operations performed on lay-barges.

120.350: Prohibitions

- (A) Industrial radiography performed with a sealed source that is not fastened to or contained in a radiographic exposure device (fishpole technique) is prohibited unless specifically authorized in a license issued by the agency.
- (B) Retrieval of disconnected sources or sources that cannot be returned by normal means to a fully shielded position or automatically secured in the radiographic exposure device, shall not be performed unless specifically authorized by a license condition.

RECORDKEEPING REQUIREMENTS

120.360: Records for Industrial Radiography

Each licensee or registrant shall maintain a copy of its license or registration, documents incorporated by reference, and amendments to each of these items until superseded by new documents approved by the Agency, or until the Agency terminates the license or registration.

120.361: Records of Receipt, Transfer, and Disposal of Sources of Radiation

- (A) Each licensee or registrant shall maintain records showing the receipts, transfers and disposal of sealed sources, devices using DU for shielding, and radiation machines, and retain each record for five years after it is made.
- (B) These records must include the date, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass (for DU), and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

120.362: Records of Radiation Survey Instruments

Each licensee or registrant shall maintain records of the calibrations of its radiation survey instruments that are required under 105 CMR 120.314 and retain each record for three years after it is made.

120.363: Records of Leak Testing of Sealed Sources and Devices Containing DU

Each licensee shall maintain records of leak test results for sealed sources and for devices containing DU. The results must be stated in units of becquerels (μCi). The licensee shall retain each record for five years after it is made or until the source in storage is removed.

120.364: Records of Quarterly Inventory

- (A) Each licensee or registrant shall maintain records of the quarterly inventory of sources of radiation, including devices containing depleted uranium as required by 105 CMR 120.316 and retain each record for five years.

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(B) The record must include the date of the inventory, name of the individual conducting the inventory, radionuclide, number of becquerels (curies) or mass (for DU) in each device, location of sources of radiation and/or devices, and manufacturer, model, and serial number of each source of radiation and/or device, as appropriate.

120.365 Utilization Logs

Each licensee and registrant shall maintain current logs of the use of each source of radiation. The logs shall include:

(A) A unique identification (e.g., serial number) of each radiation machine, each radiographic exposure device in which a sealed source is located, and each sealed source;

(B) The name of the radiographer using the source of radiation;

(C) The location(s) where each source of radiation is used and dates of use; and,

(D) The date(s) each source of radiation is removed from storage and returned to storage. For fixed installations, the date(s) each source of radiation is energized or used and the number of exposures made. Utilization logs may be kept on form MRCP 120.300-2, Utilization Log, or on clear, legible records containing all the information required by 105 CMR 120.365(A) through (D). Copies of utilization logs shall be maintained for Agency inspection for five years. The records shall be kept at the location specified by the license or certificate of registration.

120.366: Records of Inspections and Maintenance of Radiation Machines, Radiographic Exposure Devices,

Transport and Storage Containers, associated Equipment, Source Changers, and Survey Instruments

(A) Each licensee or registrant shall maintain records specified in 105 CMR 120.318 of equipment problems found in daily checks and quarterly inspections of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments; and retain each record for three years after it is made.

(B) The record must include the date of check or inspection, name of inspector, equipment involved, any problems found, and what repair and/or maintenance, if any, was performed.

120.367: Records of Alarm System and Entrance Control Tests at Permanent Radiographic Installations

Each licensee or registrant shall maintain records of alarm system and entrance control device tests required by 105 CMR 120.319 and retain each record for three years after it is made.

120.368: Records of Training and Certification

Each licensee or registrant shall maintain the following records for five years:

(A) Records of training of each radiographer and each radiographer trainee. The record must include radiographer certification documents and verification of certification status, copies of written tests and the dates of oral and practical examinations administered by the licensee or registrant, the names of individuals conducting and receiving the oral and practical examinations, and a list of items tested and the results of the oral and practical examinations; and,

(B) Records of annual refresher safety training and semi-annual inspections of job performance for each radiographer and each radiographer's assistant. The records must list the topics discussed during the refresher safety training, the dates the annual refresher safety training was conducted, and names of the instructors and attendees. For inspections of job performance, the records must also include a list showing the items checked and any non-compliance observed by the radiation safety officer or designee.

120.369: Copies of Operating and Emergency Procedures

Each licensee or registrant shall maintain a copy of current operating and emergency procedures until the Agency terminates the license or registration. Superseded material must be retained for five years after the change is made.

120.370: Records of Personnel Monitoring

Each licensee or registrant shall maintain the following exposure records specified in 105 CMR 120.323:

- (A) Direct reading dosimeter readings and yearly operability checks required by 105 CMR 120.323(B)(8) for five years after the record is made;
- (B) Records of alarming ratemeter calibrations for five years after the record is made;
- (C) Reports received from the personnel monitoring badge processor until the Agency terminates the license or registration; and,
- (D) Records of estimates of exposures as a result of off-scale personal direct reading dosimeters, or lost or damaged personnel monitoring badges until the Agency terminates the license or registration.

120.371: Records of Radiation Surveys

Each licensee or registrant shall maintain a record of each survey as specified in 105 CMR 120.333(E). Each record must be maintained for five years after it is made.

120.372: Form of Records

Each record required by 105 CMR 120.360 through 120.372 must be legible throughout the specified retention period. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of reproducing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, must include all pertinent information, such as stamps, initials, and signatures. The licensee or registrant shall maintain adequate safeguards against tampering with and loss of records.

120.373: Location of Documents and Records

- (A) Each licensee or registrant shall maintain copies of records required by 105 CMR 120.300 and other applicable Parts of 105 CMR 120.000 at the location specified in 105 CMR 120.305(K).
- (B) Each licensee or registrant shall also maintain current copies of the following documents and records sufficient to demonstrate compliance at each applicable field station and each temporary jobsite:
 - (1) The license or registration authorizing the use of sources of radiation;
 - (2) A copy of 105 CMR 120.001, 105 CMR 120.200, 105 CMR 120.300 and 105 CMR 120.750;
 - (3) Utilization logs for each source of radiation dispatched from that location as required by 105 CMR 120.317;
 - (4) Records of equipment problems identified in daily checks of equipment as required by 105 CMR 120.366(A);
 - (5) Records of alarm system and entrance control checks required by 105 CMR 120.366, if applicable;
 - (6) Records of dosimeter readings as required by 105 CMR 120.369;
 - (7) Operating and emergency procedures as required by 105 CMR 120.325;
 - (8) Evidence of the latest calibration of the radiation survey instruments in use at the site, as required by 105 CMR 120.362;

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- (9) Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required by 105 CMR120.369;
- (10) Survey records as required by 105 CMR120.370, for the period of operation at the site;
- (11) The shipping papers for the transportation of radioactive materials required by 105 CMR 120.770; and,
- (12) When operating under reciprocity pursuant to 105 CMR120.100, a copy of the applicable State license or registration, or Nuclear Regulatory Commission license authorizing the use of sources of radiation

120.380: Radiation Safety Officer

The radiation safety officer shall ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's or registrant's program.

(A) The minimum qualifications, training, and experience for radiation safety officers for industrial radiography are as follows:

- (1) Completion of the training and testing requirements of 105 CMR 120.320(B);
- (2) 2000 hours of hands-on experience as a qualified radiographer in industrial radiographic operations; and,
- (3) Formal training in the establishment and maintenance of a radiation protection program.

(B) The Agency will consider alternatives when the radiation safety officer has appropriate training and experience in the field of ionizing radiation, and in addition, has adequate experience and knowledge with respect to the establishment and maintenance of a radiation safety protection program.

(C) The specific duties of the RSO include, but are not limited to, the following:

- (1) To establish and oversee operating, emergency, and ALARA procedures as required by 105 CMR 120.200, and to review them regularly to ensure that the procedures are current and conform to Agency regulations and to the license or registration conditions;
- (2) To oversee and approve all phases of the training program for radiographic personnel so that appropriate and effective radiation protection practices are taught;
- (3) To ensure that required radiation surveys and leak tests are performed and documented in accordance with 105 CMR 120.000, including any corrective measures when levels of radiation exceed established limits;
- (4) To ensure that personnel monitoring devices are calibrated and used properly by occupationally-exposed personnel, that records are kept of the monitoring results, and that timely notifications are made as required by 105 CMR 120.200;
- (5) To ensure that any required interlock switches and warning signals are functioning and that radiation signs, ropes, and barriers are properly posted and positioned;
- (6) To investigate and report to the Agency each known or suspected case of radiation exposure to an individual or radiation level detected in excess of limits established by these rules and each theft or loss of source(s) of radiation, to determine the cause, and to take steps to prevent its recurrence;
- (7) To have a thorough knowledge of management policies and administrative procedures of the licensee or registrant;
- (8) To assume control and have the authority to institute corrective actions including shutdown of operations when necessary in emergency situations or unsafe conditions;
- (9) To maintain records as required by 105 CMR 120.000.
- (10) To ensure the proper storing, labeling, transport, and use of exposure devices and sources of radiation;
- (11) To ensure that quarterly inventory and inspection and maintenance programs are performed in accordance with 105 CMR 120.316 and 120.318; and,
- (12) To ensure that personnel are complying with 105 CMR 120.000, the conditions of the license or the registration, and the operating and emergency procedures of the licensee or registrant.

120.385: Notification of Incidents

(A) The Agency shall be notified of the loss or theft of sources of radiation, overexposures, and excessive levels in accordance with 105 CMR 120.281, 21.1202, 120.282, 120.283, and 120.288.

(B) In addition, each licensee or registrant shall submit a written report within 30 days to the Agency whenever one of the following events occurs:

- (1) A source assembly cannot be returned to the fully-shielded position and properly secured;
- (2) The source assembly becomes unintentionally disconnected from the drive cable;
- (3) Any component critical to safe operation of the radiographic exposure device fails to properly perform its intended function; or,
- (4) An indicator on a radiation-producing machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position, or a safety interlock fails to terminate x-ray production.

(C) The licensee or registrant shall include the following information in each report submitted in accordance with 105 CMR 120.385(B):

- (1) A description of the equipment problem;
- (2) Cause of each incident, if known;
- (3) Manufacturer and model number of equipment involved in the incident;
- (4) Location, time, and date of the incident;
- (5) Actions taken to establish normal operations;
- (6) Corrective actions taken or planned to prevent recurrence; and,
- (7) Names and qualifications of personnel involved in the incident.

120.390: Reciprocity

All reciprocal recognition of licenses and certificates of registration by the Agency will be granted in accordance with 105 CMR 120.190 and 120.033.